WHAT IS CLAIMED IS:

1. A laser weld quality monitoring method comprising:

welding a part of work with a laser beam irradiated thereon from a YAG laser;

detecting a varying intensity of light from the welding part to provide a detection signal;

determining a value of signal power of a frequency spectrum in a specified frequency band of the detection signal; and

making a decision for a porous state of the welding part

to be significant as the value of signal power exceeds a threshold of weld quality, and

to be insignificant as the value of signal power does not exceed the threshold of weld quality.

2. A laser weld quality monitoring method according to claim 1, wherein the detection signal comprises a varying electrical signal representing the varying intensity of the light from the welding part, and the determining the value of signal power comprises calculating a set of frequency spectra of the varying electrical signal.

3. A laser weld quality monitoring method according to claim 1, wherein the specified frequency band is varied depending on one of a thickness of the work, a welding speed, and an aspect ratio of a keyhole at the welding part.

4. A laser weld quality monitoring method according to claim 1, wherein the determining the value of signal power comprises one of passing the electrical signal to a band-pass filter and applying a Fourrier transform to data of the electrical signal.

5. A laser weld quality monitoring method comprising:

irradiating a laser beam from a YAG laser to a welding part of work;

detecting light reflected from the welding part;

calculating a frequency distribution from a set of data of the detected light within a interval of time;

calculating, from the frequency distribution, a first signal power sum in one of a first frequency band for detecting an under-filled state and a second frequency band for detecting a porous state, and a second signal power sum in a third frequency band for detecting a non-welded state;

mapping a combination of calculated values of the first and second signal power sums, in a region defined by a combination of a first axis representing the first signal power sum and a second axis representing the second signal power sum, including a sub-region representing a non-conforming state as one of the under-filled state, the porous state, and the non-welded state; and

making a decision for the welding part to have the non-conforming state, as the combination of calculated values is mapped in the sub-region.

6. A laser weld quality monitoring method according to claim 5, wherein the calculating the frequency distribution comprises converting the detected light into an electrical signal, storing data on time-dependant variations of the electrical signal, and calculating the frequency distribution from the stored data.

7. A laser weld quality monitoring method according to claim 5, wherein the region includes sub-regions representing the under-filled state, the porous state, and the non-welded state, respectively.

8 A laser weld quality monitoring method according to claim 5, wherein the region includes a sub-region representing a conforming state of the work.

9. A laser weld quality monitoring method according to claim 5, wherein the region includes a sub-region representative of at least tow of the under-filled state, the porous state, and the non-welded state.

10. A laser weld quality monitoring method according to claim 5, further comprising:

calculating, from a subset of the set of data, a subsidiary frequency distribution of the detected light within a sub-interval of the interval of time;

calculating, from the subsidiary frequency distribution, a first subsidiary signal power sum in one of a first subsidiary frequency band for detecting an under-filled state in a sub-section of the welding part corresponding to the sub-interval and a second subsidiary frequency band for detecting a porous state in the sub-section, and a second subsidiary signal power sum in a third subsidiary frequency band for detecting a non-welded state in the sub-section;

mapping in the region a combination of calculated subsidiary values of the first and second subsidiary signal power sums;

making a decision for the sub-section of the welding part to have the non-conforming state, as the combination of calculated subsidiary values is mapped in the sub-region; and

concluding a weld quality of the welding part based on the decision for the sub-section.

11. A laser weld quality monitoring method according to claim 10, wherein the concluding the weld quality depends on a conforming proportion of the sub-section to the welding part.

12. A laser weld quality monitoring method according to claim 10, wherein one of the first, second, and third subsidiary frequency bands is varied depending on

one of a thickness of the work, a welding speed, and an aspect ratio of a keyhole at the sub-section of the welding part.

13. A laser weld quality monitoring system comprising:

a welder configured to weld a part of work with a laser beam irradiated thereon from a YAG laser;

a detector configured to detect a varying intensity of light reflected from the welding part to provide a detection signal;

a value determiner configured to determine a value of signal power of a frequency spectrum in a specified frequency band of the detection signal; and

a decision-maker configured to make a decision for a porous state of the welding part

to be significant as the value of signal power exceeds a threshold of weld quality, and

to be insignificant as the value of signal power does not exceed the threshold of weld quality.

14. A laser weld quality monitoring system comprising:

welding means for welding a part of work with a laser beam irradiated thereon from a YAG laser;

detecting means for detecting a varying intensity of light reflected from the welding part to provide a detection signal;

value determining means for determining a value of signal power of a frequency spectrum in a specified frequency band of the detection signal; and

decision-making means for making a decision for a porous state of the welding part

to be significant as the value of signal power exceeds a threshold of weld quality, and

to be insignificant as the value of signal power does not exceed the threshold of weld quality.

15. A laser weld quality monitoring system comprising:

a laser welder configured to irradiate a laser beam from a YAG laser to a welding part of work;

a detector configured to detect light reflected from the welding part;

a calculator configured to calculate a frequency distribution from a set of data of the detected light within a interval of time;

a calculator configured to calculate, from the frequency distribution, a first signal power sum in one of a first frequency band for detecting an under-filled state and

a second frequency band for detecting a porous state, and a second signal power sum in a third frequency band for detecting a non-welded state;

an operator configured to map a combination of calculated values of the first and second signal power sums, in a region defined by a combination of a first axis representing the first signal power sum and a second axis representing the second signal power sum, including a sub-region representing a non-conforming state as one of the under-filled state, the porous state, and the non-welded state; and

a decision-maker configured to make a decision for the welding part to have the non-conforming state, as the combination of calculated values is mapped in the sub-region.

16. A laser weld quality monitoring system comprising:

laser welding means for irradiating a laser beam from a YAG laser to a welding part of work;

detecting means for detecting light reflected from the welding part;

calculating means for calculating a frequency distribution from a set of data of the detected light within a interval of time;

calculating means for calculating, from the frequency distribution, a first signal power sum in one of a first frequency band for detecting an under-filled state and a second frequency band for detecting a porous state, and a second signal power sum in a third frequency band for detecting a non-welded state;

operator means for mapping a combination of calculated values of the first and second signal power sums, in a region defined by a combination of a first axis representing the first signal power sum and a second axis representing the second signal power sum, including a sub-region representing a non-conforming state as one of the under-filled state, the porous state, and the non-welded state; and

decision-making means for making a decision for the welding part to have the non-conforming state, as the combination of calculated values is mapped in the sub-region.